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| 09/809,038      | 03/16/2001  | Shuji Nakamura       | 160-356             | 5596             |

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EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 04/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/809,038

Applicant(s)

NAKAMURA ET AL.

Examiner

Wai-Sing Louie

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 05 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 63,64,66 and 71 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 63,64,66 and 71 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Double Patenting*

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 63-64, 66, and 71 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent No. 5,652,434 in view of Edmond et al. (US 5,592,501) and Hayakawa et al. (US 4,759,024).

With regard to claim 63-64, US 5,652,434 discloses a gallium nitride light-emitting device comprising:

- An n-type layer comprising an n-type GaN or an n-type nitride semiconductor containing indium and gallium (claim 1 and 2);
- A first p-type layer comprising a p-type nitride semiconductor containing indium and gallium (claim 1 and 2);
- US 5,652,434 does not disclose an active layer. However, Edmond et al. disclose an active layer provided between the n-type and p-type nitride semiconductor layer having a quantum well structure comprising InGaN (Edmond col. 4, line 66

and col. 5, line 23). Edmond et al. teach using a quantum well structure has the lowest bandgap into which electrons tends to fall, thus helping enhance the confinement (Edmond col. 5, lines 16-30). Therefore, it would have been obvious to one with ordinary skill in the art to modify the device in US 5,652,434 with the teaching of Edmond et al. to provide a quantum well structure having an InGaN well layer. Doing so would enhance the carrier confinement;

- US 5,652,434 does not disclose a second p-type clad layer. However, Hayakawa et al. disclose a p-type superlatticed clad layer 5 (Hayakawa col. 2, line 45) and a superlatticed clad layer includes a second cladding layer. Hayakawa et al. teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal (Hayakawa col. 2, lines 3-19). Hence, it would have been obvious to one with ordinary skill in the art to modify the device in US 5,652,434 with the teaching of Hayakawa et al. to provide a p-type superlatticed clad layer in order to have a lattice matched structure;
- US 5,652,434 does not disclose a p-type contact layer formed of a p-type GaN provided over the first p-type clad layer. However, Edmond discloses a p-type GaN contact layer 16 (Edmond col. 5, line 13 and col. 6, lines 11-13). Edmond et al. teach the contact layer can serve as the top contact and minimizing strain for the overall structure (Edmond col. 5, lines 13-14). Hence, it would have been obvious to one with ordinary skill in the art to modify the device in US 5,652,434

with the teaching of Edmond et al. to provide a contact layer in order to provide the top contact and minimizing strain for the overall structure.

With regard to claim 66, US 5,652,434 disclose an n-type contact formed of an n-type GaN (claim 1) and US 5,652,434 modified by Edmond et al. in claim 63 above, would have the p-type contact layer 16 formed of p-type GaN.

With regard to claim 71, in addition to the limitations disclosed in claim 63 and 64, US 5,652,434 also discloses:

- A substrate (claim 1);
- An n-type layer formed of n-type GaN provided over the substrate (claim 1);
- A negative electrode (claim 1);
- A positive electrode (claim 1);
- A first p-type layer formed of p-type AlGaIn provided over the active layer (claim 1 and 2);
- US 5,652,434 does not disclose a second n-type clad layer. However, Hayakawa et al. disclose superlatticed cladding layer 3, which includes a second n-type clad layer. Hayakawa et al. teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal (Hayakawa col. 2, lines 3-19). Hence, it would have been obvious to one with ordinary skill in the art to modify the device in US 5,652,434 with the teaching of Hayakawa et al. to provide a n-type superlatticed clad layer in order in order to have a lattice matched structure;

- US 5,652,434 discloses the p-type clad layer comprising p-type nitride semiconductor containing aluminum and gallium, but does not disclose the thickness. However, US 5,652,434, modified by Edmond et al. in claim 63 above, would disclose the p-type superlatticed cladding layer.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 63-64, 66, and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond et al. (US 5,592,501) in view of Hayakawa et al. (US 4,759,024).

With regard to claims 63 and 64, Edmond et al. disclose a gallium nitride light-emitting device (col. 4, line 55 to col. 9, line 43 and fig. 1) comprising:

- An n-type layer comprising an n-type GaN or an n-type nitride semiconductor containing indium and gallium (fig. 1);
- An active layer provided between the n-type and p-type nitride semiconductor layer having a quantum well structure comprising InGaN (col. 4, line 66 and col. 5, line 23);
- A p-type GaN contact layer 124a (col. 10, line 49);

- A first p-type layer comprising a p-type nitride semiconductor, but do not disclose the layer containing indium and gallium. However, Hayakawa et al. teach the III-V nitride could be represented by a general formula  $A_xB_{1-x}N$ , where A and B are group III elements. Therefore, it is obvious A and B could contain indium and gallium;
- Edmond et al. do not disclose a second p-type clad layer. However, Hayakawa et al. disclose a p-type superlatticed clad layer 5 (Hayakawa col. 2, line 45) and a superlatticed clad layer includes a second cladding layer. Hayakawa et al. teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal (Hayakawa col. 2, lines 3-19). Hence, it would have been obvious to one with ordinary skill in the art to modify Edmond's device with the teaching of Hayakawa et al. to provide a p-type superlatticed clad layer in order to have a lattice matched structure.

With regard to claim 71, in addition to the limitations disclosed in claim 63 and 64, Edmond et al. also discloses:

- An n-type layer formed of n-type GaN provided over the substrate (fig. 1);
- A negative electrode (fig. 1);
- A positive electrode (fig. 1);
- A first p-type layer formed of p-type AlGaIn provided over the active layer (fig. 1);

- Edmond et al. disclose a p-type clad layer, but do not disclose the thickness.

However, Edmond et al., modified by Hayakawa et al. in claim 63 above, would disclose the p-type superlatticed cladding layer.

Claim 66 is rejected under 35 U.S.C. 103(a) as being unpatentable over Edmond et al. (US 5,592,501) modified by Hayakawa et al. (US 4,759,024) as applied to claim 63 above, and further in view of Chai (US 5,625,202).

With regard to claim 66, Edmond et al. disclose the p-type contact formed of p-type GaN, but do not disclose an n-type contact formed of an n-type GaN. However, it is common to have an n-type contact layer in the LED device, such as Chai (fig. 8). Therefore, it is obvious to provide an n-type GaN contact layer and over which the second n-type clad layer is provided.

### *Response to Arguments*

Applicant's arguments filed 9/18/02 have been fully considered but they are not persuasive.

- Applicant argues that US 5,652,434 is silent about the clad layers. However, US 5,652,434 modified by Edmond et al. would disclose an active layers and the first n-type semiconductor layer and the first p-type semiconductor layer would become cladding layers to the active layer. Thus, the combination is proper.
- Applicant argues that Edmond et al. do not disclose to form the first p-type clad layer with a p-type nitride semiconductor comprising In and Ga. However,



Edmond et al. teach the Group III nitride could be represented by a general formula  $A_xB_{1-x}N$ , where A and B are group III elements (Edmond col. 4, lines 12-14), which includes indium and gallium.

- Applicant argues that Hayakawa et al. only disclose a GaP/AIP semiconductor device and is irrelevant to nitride semiconductor. However, Hayakawa et al. teach the superlatticed cladding layer would provide a lattice-match between the substrate and the rest of the structure and can grow good quality crystal (Hayakawa col. 2, lines 3-19). Thus, Edmond et al. modified by Hayakawa et al. would disclose a superlatticed cladding layer, which includes a first and second cladding layers. Hayakawa's teaching could be applied to other semiconductor materials structure and not limited to GaP/AIP materials.

### *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

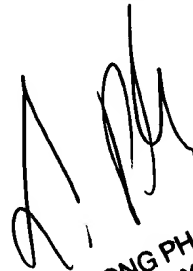
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

  
LONG PHAM  
PRIMARY EXAMINER

  
wsl

March 25, 2003